CLAIMS:

1. A quantum communication system comprising:

an emitter configured to emit a plurality of photon pulses in groups of photon pulses, each group of photon pulses emitted over a group time period, each photon pulse having a probability of containing at most one photon;

a detector comprising gating means configured to switch the detector between an on state and an off state;

wherein the detector is in an on state for at least the duration of two photon pulses during said group time period.

2. The system of claim 1, wherein the detector is in an on state for the whole of a said group time period.

3. The system of claim 1, wherein the detector is repetitively switched on and off during said group time period, so as to be on during the arrival of the photon pulses.

4. The system of claim 1, comprising means to ignore any second or subsequent signals received by the detector in a given group time period after a first signal has been received.

5. The system of claim 1, further comprising means to communicate a clock signal between the emitter and detector.

6. The system of claim 5, wherein a clock pulse is sent from the emitter to the detector with each group of photons.

7. The system of claim 6, wherein the clock signal has a different wavelength to that of the photon pulses.

8. The system of claim 6, wherein the clock signal has a different polarisation to that of the photon pulses.

9. The system of claim 1, wherein the detector is an avalanche photodiode.

10. The system of claim 1, wherein the photons which are sent to the detector are encoded.

11. The system of claim 10, wherein the each photon pulse in a group of photon pulses is encoded independently of the other pulses in the group of photon pulses.

12. The system of claim 10, wherein the photon pulses are encoded using phase.

13. The system of claim 12, further comprising a first interferometer having a long arm and a short arm, one of said arms having phase variation means which allows the phase of a photon passing through that arm to be set to one of at least two values.

14. The system of claim 13, further comprising a second interferometer having a long arm and a short arm, one of said arms having phase variation means which allows the phase of a photon passing through that arm to be set to one of at least two values.

15. The system of claim 14, the detector being further configured to ignore signals from photon pulses which pass through the long arms of both interferometers or the short arms of both interferometers.

16. The system of claim 14, further comprising directing means configured to ensure that photons which have passed through the short arm of the first interferometer are directed down the long arm of the second interferometer and photons which have passed through the long arm of the first interferometer pass through the short arm of the second interferometer.

17. The system of claim 16, wherein the directing means comprises first polarising means configured to allow photons which have travelled through different arms of the first interferometer different polarisations and second polarising means which

distinguish between the photons having different polarisations and direct them down the appropriate arm of the second interferometer.

18. The system of claim 12, wherein the phase encoding means comprises a first interferometer comprising a long arm and a short arm; and a second interferometer comprising a long arm and a short arm, the first and second interferometers being configured such that a photon passing through the first interferometer experiences a different change in its phase to a photon travelling through the second interferometer, the phase encoding means further comprising first switching means to direct a photon into either the first interferometer or the second interferometer.

19. The system of claim 18, further comprising a third interferometer comprising a long arm and a short arm and a fourth interferometer comprising a long arm and a short arm, the third and fourth interferometers being configured such that a photon passing through the third interferometer experiences a different change in its phase to a photon travelling through the fourth interferometer, the system further comprising means to direct a photon into either the third interferometer or the fourth interferometer.

20. The system of claim 19, the detector being further configured to ignore signals from photon pulses which pass through the long arms of either the first and second interferometers and the long arms of either of the third and fourth interferometers and to ignore signals from photon pulses which have passed through the short arms of either of the first and second interferometers and the short arms of either of the third and fourth interferometers.

21. The system of claim 12, wherein the phase encoding means comprises a first station comprising first interferometer having a long arm and a short arm, one of said arms having a phase variation means which allows the phase of a photon passing through that arm to be set to one of at least two values, a second station comprising means to apply a phase variation which allows a photon pulse passing therethrough to have its phase set to one of at least two values and reflecting means to reflect the pulse back through the first interferometer.

22. The system of claim 21, wherein the detector is configured to ignore photon pulses which have passed through either the long arm of the first interferometer twice or the short arm of the first interferometer twice.

23. The system of claim 22, further comprising directing means configured to ensure that photons which have passed through the short arm of the first interferometer are reflected back through the long arm of the first interferometer and photons which have passed through the long arm of the first interferometer are reflected back through the short arm of the first interferometer.

24. The system of claim 23, wherein the directing means comprises first polarising means configured to allow photons which have travelled through different arms of the first interferometer to have different polarisations and second polarising means which distinguish between the photons having different polarisations and direct them down the appropriate arm of the first interferometer.

25. The system of claim 13, further comprising means to vary the path length of one of the arms of at least one of the interferometers such that photon pulses which take the short arm of one of the first interferometer and the long arm of the second interferometer take the same time to pass through both interferometers as photon pulses which pass through the long arm of the first interferometer and the short arm of the second interferometer.

26. The system of claim 18, further comprising means to vary the path length of one of the arms of at least one of the interferometers such that photon pulses which take the short arm of first or second interferometers and the long arm of the third or fourth interferometers take the same time to pass through both interferometers as photon pulses which pass through the long arm of the first or second interferometers and the short arm of the third or fourth interferometers.

27. The system of claim 10, wherein the photons are encoded using polarisation.

28. The system of claim 1, wherein there are from 2 to 1000 photon pulses in each group period.

29. The system of claim 1, wherein there is a separation from 100 ns to 10 μs between the final pulse in any group and the first pulse in the following group.

30. The system of claim 1, wherein separation between photon pulses is from 0.5 to 5 ns.

31. The system of claim 1, wherein the probability of a photon being present in a photon pulse is less than 0.2.

32. The system of claim 1, wherein said emitter comprises a photon source, means to subdivide the output of said source into a plurality of optical fibres having differing lengths and combiner means to combine said plurality of fibres such that a plurality of pulses spaced apart in time are outputted from said combiner means.

33. A method of quantum communication comprising:

emitting a plurality of photon pulses in groups of photon pulses from an emitter, each group of photon pulses emitted over a group time period, each photon pulse having a probability of containing at most one photon;

detecting the emitted pulses, wherein the detector is in an on state for at least the duration of two photon pulses during said group time period during detection.

34. A method of operating a detector in quantum communication system, wherein a plurality of photon pulses are sent to the detector in groups of photon pulses from an emitter, each group of photon pulses emitted over a group time period, each photon pulse having a probability of containing at most one photon, the method comprising:

detecting the emitted pulses, by placing the detector in an on state for at least the duration of two photon pulses during said group time period during detection.